GeoSoils, Inc.

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Transportation Corridor Agencies
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Attention: Ms. Maria Lavario

Subject: Preliminary Clast (Cobble Fraction) Provenance Study, Lower San Mateo Creek, in Conjunction with the South Orange County Transportation Project, Orange County, California

Dear Ms. Lavario:

In accordance with your request, and in coordination with RBF Consulting, GeoSoils, Inc. (GSI) has prepared this report with respect to the provenance of cobble-sized clasts contained within San Mateo Creek and Delta. This study has been prepared in conjunction with the South Orange County Transportation Infrastructure Improvement Project (SOCTIIP) and the Preferred Alternative (the A7C-FEC-M-Initial, as modified).

This report formalizes the memo that was prepared in early 2006 to address comments received on the proposed project when the SOCTIIP Final Environmental Impact Report was certified and the Preferred Alternative was selected.

This issue has been of primary concern to some members of the surfing community who assert that construction of the Preferred Alternative would negatively affect the surf break at Trestles by eliminating or reducing the cobble supply to the beach. It is recognized that the cobbles on the shoreline at Trestles are the foundation of the surf break. I have evaluated the primary source of the cobbles. Since our 2006 Memo, there has been no new information offered that changes the conclusion presented in this report.

The purpose of this study was to provide a preliminary characterization of cobble provenance (source area) for cobbles observed within the active stream channel of the lower San Mateo Creek, including a portion of Cristianitos Creek (lower most reach), north of the confluence of Cristianitos and San Mateo Creeks. This study has been prepared with respect to the impacts of the Preferred Alternative on the cobble supply to the beach (Trestles) from San Mateo Creek.

SCOPE OF SERVICES

The scope of services provided in preparation of this study are as follows:

- Review available geologic/geotechnical documents relative to the area (see the Appendix).
- Perform a field reconnaissance to observe bed load clasts within the active creek channels, cobble delta, and vicinity.
- Geologic evaluation of cobble petrology (i.e., rock type)/provenance.
- Preparation of this geologic report.

Study Area/Field Work

The area evaluated includes the entire San Mateo Creek watershed (Figure 1). Field work was performed during late March 2006, at several localities along the lower reach of San Mateo Creek, and along Cristianitos Creek (tributary to San Mateo Creek), near the confluence with San Mateo Creek. Samples were observed and collected at:

1. San Mateo Creek delta, Trestles Beach, (observed at low tide on March 29, 2006).
2. The San Mateo Campground.
3. Cristianitos Creek/San Mateo Creek confluence (Marine Corps Base, Camp Pendleton [MCBCP]).
4. Cristianitos Creek at Camp Talega (MCBCP).
5. Gunnery Range along San Mateo Creek (MCBCP)

Approximate site localities are shown on Figure 2.

Findings

Field observations of cobble-sized clasts were performed within the active channels of both Cristianitos and San Mateo Creeks, and the San Mateo Creek "delta" at Trestles. Observations indicated that the cobbles are primarily composed of metavolcanic and metasedimentary rock, with lesser amounts of granitic rock.

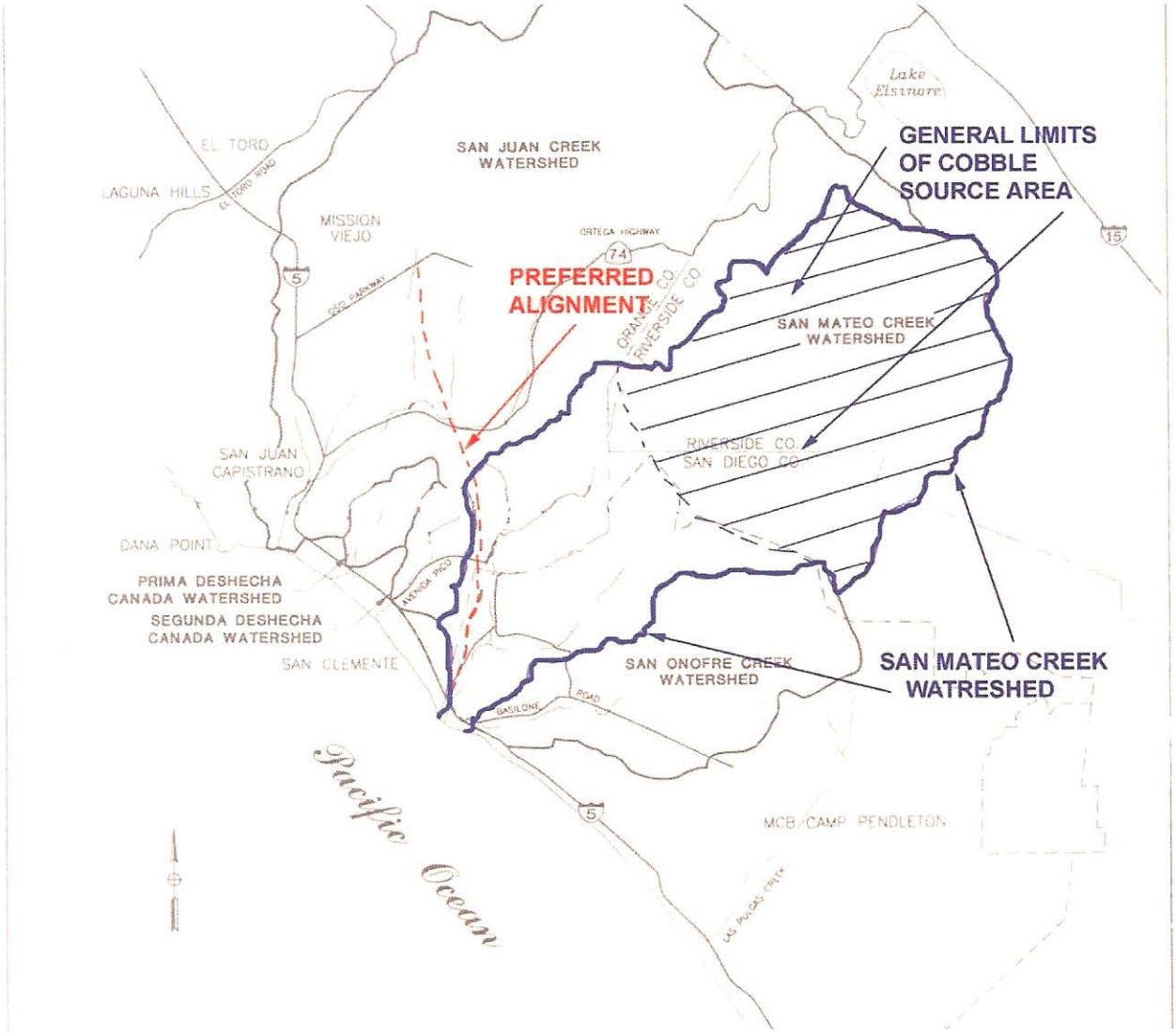

Figure 1. San Mateo Creek Watershed and area of cobble source.

Figure 2. Locations of cobble samples and observations.

A review of the Preferred Alternative indicates that the alignment will be located along the western edge of the San Mateo Creek watershed (see Figure 1). The alignment will traverse terrain predominantly underlain with Tertiary-age sedimentary bedrock, consisting of sandstones, siltstones, mudstones, and claystones, with local conglomeratic lenses, and/or layers. Locally, the alignment will traverse younger, Quaternary-age landslide, marine terrace, and terrestrial (stream) terrace deposits. Field observations and our literature review indicate that the Tertiary-age sediments are predominantly fine grained. Clast size within the younger, Quaternary-age deposits, such as the mapped landslide deposits in the area (Morton and Miller, 1981; and Tan, 1999), are likely similar to the underlying, relatively fine grained bedrock where the slide(s) were generated. Cut banks observed in strath terraces flanking San Mateo Creek exposed older interbedded channel (coarse) and overbank (fine) stratigraphy, typical of the older stream deposits in the area. Quaternary-age marine terrace deposits, observed in the area, are also contained interbedded fine (sands, silts, and clay) and coarse (gravel and cobbles). Field observations of these deposits indicate that the cobbles are primarily composed of metavolcanic and metasedimentary rock, with lesser amounts of granitic rock.

Based on our review, it appears that the majority of the San Mateo watershed (east portion) is underlain with Mesozoic age sedimentary, granitic rock, metasedimentary, and metavolcanic rock (the bedrock source of the cobbles). Sedimentary rock appears to consist of siltstones, sandstones, conglomeratic sandstone, and fanglomerate (coarse grained deposit predominantly composed of gravel through large boulder sized clasts). Crystalline "basement" rock appears to consist of a mixture of metavolcanic, metamorphic (metasedimentary), and granitic rock (Larsen, 1948; and Blanc, et al., 1968).

CONCLUSIONS

Excluding active alluvial deposits, such as stream beds, deltas, etc., cobbles appear to occur locally within:

- The older, Quaternary-age, marine/stream terrace deposits.
- The conglomeratic (i.e., containing gravels, cobbles, or larger clasts) zones/layers, within the Tertiary age sedimentary rock (Tan, 1999).
- Mesozoic sedimentary deposits, including a "fanglomerate" consisting predominantly of clasts ranging from 3 inches, to over 3 feet in dimension (Moyle, 1972).

While these deposits contain some cobbles, the overall abundance of cobble, and the amount of cobble available for transport into the active alluvial system (with the exception of the Fanglomerate), is considered to be a relatively insignificant source of cobbles based upon our field reconnaissance. Furthermore, as noted within the Quaternary-age terrace deposits, the lithology of the cobble-size clasts is generally the same as what is contained within the active depositional system, indicating that the "source" of the cobble size bed load is likely derived from the erosion of the more resistant bedrock materials located within the upper, eastern reaches of the watershed (see Figure 1). A review of available geologic mapping of the region (Moyle, 1973; Larson, 1948; and Blanc, et al., 1968) indicates that substantial bodies of metavolcanic rock (Santiago Peak Volcanics), metasedimentary rock (Bedford Canyon Formation), and granitic rock (Woodson Mountain granodiorite, San Marcos Gabbro, etc.) occur throughout the eastern watershed. As our observations made at the various site localities indicate, the cobble lithologies observed (i.e., metavolcanic, metasediementary, and granitic) are generally the same; therefore, the source, or provenance, of the cobble-sized clasts is considered to be predominantly from the Mesozoic-age crystalline bedrock, underlying the eastern portions of the watershed (see Figure 1).

The Preferred Alternative is confined to the western margin of the watershed, and traverses primarily fine grained sedimentary deposits that do not appear to have significantly contributed to the cobble-size fraction within the active stream channel. The older stream

terraces in the vicinity of the alignment could be a local source of cobble (cut bank erosion); however, it is noted that these deposits generally occur below the alternative, and will not be impacted due to their location below the alignment.

To summarize, the source of the cobble-sized clasts observed within the active depositional system of the San Mateo watershed appear to be the pre-Tertiary-age metavolcanic, metasedimentary, and granitic bedrock underlying the eastern portions of the watershed. The Preferred Alternative is located west of these areas and does not traverse terrain underlain with materials considered to be a significant source of cobble-size clasts.

LIMITATIONS

The conclusions and recommendations presented herein are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty, either express or implied, is given. Standards of practice are subject to change with time. Use of this report constitutes an agreement and consent by the user to all the limitations outlined above, notwithstanding any other agreements that may be in place.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact our office.

Respectfully submitted,

GeoSoils, Inc.

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RGC/DWS/JPF/jk/jh

Attachment: Appendix - References

Distribution: (4) Addressee

APPENDIX

REFERENCES

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